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ABSTRACT

A two-phased training study attempted (1) to accelerate the rate at which a total of 8 severely and profoundly retarded children (mean age 57 months) developed the Piagetian concept of object permanence and (2) to demonstrate generalization of the higher performance on object permanence scale to other scales of sensorimotor intelligence and to the learning of expressive language. The first phase focused on training the Ss in the area of object permanence. In the second phase the Ss (4 from phase 1, 2 control and 2 experimental, and 2 newly selected Ss matched for age and etiology) received language training. Among results were that all of the phase 1 Ss achieved criterion for the highest item on the scale used; and that, in phase 2, Ss who had achieved object permanence (whether with or without training) progressed far more than Ss who had not mastered this concept. (PHR)

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On Training Generalized Thinking

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On Training Generalized Thinking

James V. Kahn

The purpose of this paper is to present some ideas and data pertinent to the training of Piagetian concepts. While the study on which I am going to report is an attempt to train severely retarded children at the sensorimotor level, I believe it is necessary to first discuss the training of Piagetian concepts in more general terms. Since most of the research in this area has dealt with the training of intellectually average children to achieve conservation, I will include this area of research in my discussion.

Kuhn (1974) analyzed the conservation training research with respect to theoretical and methodological concerns. The first concern that Kuhn delineated, is the question of how to determine whether a particular training study has been successful. In other words, what criteria must be demonstrated for the training to be considered a success? Piaget and his colleagues have argued that in order to demonstrate that a child has achieved conservation through training, it must be shown that the child can give appropriate explanations for conservation responses, that the conserving response should be durable, and that the conservation construct should generalize to materials which have not been included in the program of training. The need for explanations is the most controversial of these Piagetian requirements. Kuhn cites Brainerd as a major opponent of the need for explanations. Brainerd (1973) argues that requiring a child to express conservation linguistically

may lead to Type II errors. He bases the argument on the Piagetian belief that the cognitive structures necessary for conservation must be present prior to the ability to express the concept linguistically, thus presenting the possibility that some children will have attained the ability to conserve but not yet be able to put their reasoning into words. Kuhn, however, argues correctly that any dichotomous choice, as in conservation, leads to a high probability of Type I error and that this type of error is a more serious problem in training studies than Type II errors. Another problem with the use of explanations is that nearly all conservation training procedures either explicity or implicity include explanations in the training. Thus, the child may not be expressing understanding when he gives a correct explanation for his conserving response. We must then view appropriate explanations as a necessary but not sufficient criterion for demonstrating successful training on conservation (Kuhn, 1974).

Likewise, Kuhn points out that demonstrating that the conservations learned persist over time is also necessary but not sufficient for demonstrating successful training. A subject's giving the correct conserving response on a second posttest some time later does not necessarily imply understanding of the concept on his part.

The third criterion, that of generalization, is the critical one in demonstrating the success of a training procedure. As Kuhn points out, this is necessarily so from both pragmatic and

theoretical perspectives. It is obvious that if a child gives correct responses to problems on which he was not trained, he must have acquired more than just specific responses. In addition, if a child has truly achieved a new stage of cognitive development, thereby implying a restructuring of his mode of thought, there should be changes in a whole host of behaviors. Thus, if a child is trained in one form of conservation, we look for generalization through other untrained conservations. However, in light of the frequently demonstrated horizontal décalage, we must realize that this sort of generalization, which is usually sought after, may be extremely difficult to demonstrate. On the other hand, it may be possible to demonstrate another type of generalization. Since Piaget's theory is a readiness model (Brainerd, in press), meaning that the learning of certain skills must be preceded by the acquisition of prerequisite cognitive structures, we may look to see if children trained on Piagetian concepts learn certain skills more quickly than children not receiving this training. The major problem here is in delineating specific skills which are dependent upon a specific level of cognitive functioning. One hypothesized area may be the learning of arithmetic concepts being dependent upon conservation of number. Thus, if children trained in conservation of number were shown to learn arithmetic concepts more quickly than children who did not receive training and were still at the preoperational stage of development, we would think that the teaching of conservation of number may have caused a restructuring which resulted in the children being more prepared to learn these arithmetic

concepts. We would also need to demonstrate that the trained children retained their advantage over a period of time and could explain their conserving responses. Thus, the child would need to demonstrate generalization, explanations of conservation, and durability of the change. Of course the need for explanations can be eliminated by training prelingual concepts, i.e., sensorimotor concepts. This would leave us only needing to demonstrate generalization and durability.

Before pursuing this matter, and presenting my own study which deals with training severely retarded children in object permanence, I would like to review some of the literature which is pertinent to research using Piagetian theory with severely retarded individuals.

Although Piaget's own work has been with individuals of average or above average intelligence, there exists a large body of literature which has focused on demonstrating the concordance of Piaget's theory with mentally retarded persons. Until very recently, this literature had dealt almost exclusively with mildly retarded children and adolescents. This research has demonstrated that mildly retarded individuals develop cognitively in the same order and manner as non-retarded children, though at a slower rate (e.g., Inhelder, 1968; Stephens & McLaughlin, 1974; Woodward, 1961 1962; Stephens, McLaughlin, & Mahaney, Note 1); that Piaget's theory can be useful in the assessment of retarded individuals (e.g., Inhelder, 1966, 1968; Kahn, 1975b; Stephens, 1966); and that Piaget's theory may be useful in improving educational practices with mildly retarded children (e.g., Droz, 1970; Gotts, 1970; Kahn & Reid, 1975; Kirk, 1968).

Recently there have been several studies reported which have attempted to demonstrate ways in which Piaget's theory, in particular his sensorimotor period, can be of use to those working with severely and profoundly retarded persons. It appears from much of this research, that Piaget's theory of cognitive development can be applied to severely and profoundly retarded individuals. This thoery can be used to better understand certain behaviors of individuals, to determine the level of an individual's cognitive functioning, and perhaps, based on an individual's level of cognitive functioning, to determine appropriate educational programming.

Many severely and profoundly retarded individuals can be shown to be functioning cognitively at the sensorimotor period. Woodward (1959) first demonstrated that many profoundly retarded children and adolescents could be identified as functioning at one of the six stages of Piaget's sensorimotor period. This study was important for a number of reasons. It was the first study since Inhelder's (1968), which was first published in 1943, which suggested the applicability of Piaget's theory of cognitive development with retarded persons. It also extended Inhelder's research in indicating that Piaget's sensorimotor period is as relevant to the assessment of low functioning retarded individuals as Inhelder had indicated the higher stages of Piaget's theory were relevant to the assessment of moderately and mildly retarded individuals.

Woodward studied the repetitive hand mannerisms of profoundly

retarded children and adolescents and clearly demonstrated that some of these seemingly purposeless and bizarre appearing behaviors are understandable in terms of Piaget's sensorimotor period. For instance, a child holding his hand at face level and intently looking at it while moving his fingers or opening and closing his hand could be demonstrating a primary circular reaction. This behavior, while appearing very strange in an older retarded individual, is perfectly normal and expected of an individual functioning at stage two of the sensorimotor period. Similarly, repetitive banging, shaking, or hitting of objects could be a demonstration of a tertiary circular reaction (stage five). These seemingly strange behaviors, and others, are to be expected of severely and profoundly retarded individuals, who are functioning within the sensorimotor period, and should be viewed as possibly indicating the stage at which an individual is functioning cognitively.

It was a number of years, after Woodward's study, before other researchers became involved in the utility and relationship of Piaget's theory to low functioning retarded individuals. Bricker and Bricker's (Note 2) monograph contained a series of research reports which were based upon an understanding of Piaget's sensorimotor period. Three of these reports (Robertson & Bricker, Note 3; Robinson, Chatelanat, Spritzer, Robertson & Bricker, Note 4; Spritzer, Note 5) demonstrated that many of the items from the Uzgiris and Hunt scales (1975) and Escalona and Corman scales (Note 6), could be administered reliably to developmentally

delayed children. One of these reports (Spritzer, Note 5) also indicated that developmentally delayed and nondelayed children exhibit the same order of the Means-Ends Assessment and that this scale could be considered to be ordinal.

It appears that scales of sensorimotor period development, such as the Uzgiris and Hunt (1975) scales, could be of use in assessing the cognitive functioning of severely and profoundly retarded children. Since we can not assume that a reliable and valid infant test will also be reliable and valid with a population that is replete with brain defects and experiential deficits, I found it necessary to determine if the Uzgiris and Hunt scales are reliable and valid with severely and profoundly retarded children. I (Kahn, 1976) studied 63 severely and profoundly retarded children between 42 and 126 months of age on the seven Uzgiris and Hunt scales. Inter-examiner and Test-retest reliabilities ranged from .78 to .96 for the seven scales. Scalogram analyses were also performed on six of the seven scales; no analysis being undertaking on the Development of Schemes scale. Green's Index of Consistency ranged from .812 to 1.0; all six scales being found ordinal. It appears from this study that all of the Uzgiris and Hunt scales can be used reliably, and at least six of these scales validly, with severely and profoundly retarded children.

In the area of training studies, there have been a few recent studies which have attempted to alter or accelerate the sensorimotor period development of severely retarded children. Robinson

(1974) questioned Piaget's interpretation of stage four object permanence behavior. In this study, Robinson demonstrated that, by using systematic training procedures, developmentally delayed children could be taught to demonstrate stage four of object permanence with one stimulus and stage five of object permanence with a different stimulus. While Robinson views this as suggesting an interpretation of the stage four object permanence error, other than the Piagetian interpretation, it can also be viewed as an indication that systematic efforts can affect a child's level of functioning.

Brassell and Dunst (1976) reported on an attempt to train severely retarded children to more rapidly acquire the object permanence construct. They compared two training procedures each of which consisted of directly teaching the construct in eight, ten minute sessions. While both of the training procedures resulted in a rapid and significant acquisition of object permanence, the children did not demonstrate long term retention of the construct or generalization. Thus, this study failed the tests of durability and generalization which are necessary to demonstrate success of a training procedure.

In a recently completed dissertation, Henry (Note 8) demonstrated both durability and generalization. In this study, the subjects were 57 mentally retarded children between 6 and 64 months of age. For 12 weeks the children received training in object permanence, vocal imitation, and gestural imitation from their parents. Following the training period, the children

demonstrated significant improvement on all three of the Uzgiris and Hunt scales of the same names. They also demonstrated significant improvement on three other Uzgiris and Hunt scales for which they received no training: Development of Means, Development of Causality, and Construction of Object Relations in Space. Thus, this study meets the test of generalization. Henry also demonstrated durability of training by giving a second posttest six weeks after the training was completed. The children maintained their gains on all three of the trained scales.

Now let us return to our earlier problem of specifing a particular skill which is dependent upon a specific cognitive level. One skill area in programs for low functioning retarded children in which Piaget's theory could play an important role, is language acquisition. There have been numerous, seemingly successful attempts, using operant conditioning techniques, to develop speech with severely and profoundly retarded children who have never exhibited speech. Sailor, Guess, and Baer (1973) reviewed many of these attempts and pointed to the one serious limitation common to all of them. This limitation is that, while most of the subjects developed some speech, the studies have failed to demonstrate generalization, so that after the training program was completed the children continued to learn more vocabulary and improve their grammatical structure. They went on to suggest that this can be corrected through still more operant conditioning. They totally ignore the possibility that the children did not generalize because they had been taught only to respond

on cue and were not cognitively ready to develop speech. Several recent publications (Kahn, 1975a; Moerk, 1975; Morehead & Morehead, 1974; Piaget, 1970; Sinclair, 1971, 1975; Sinclair-DeZwart, 1973; Moerk Note 7) have indicated and/or hypothesized a relationship between sensorimotor period functioning and acquisition of verbal skills. These articles have all suggested that spontaneous speech does not develop until the end of the sensorimotor period, i.e., stage six. Moerk (1975) has very clearly indicated the order and stage in which various prelinguistic skills occur which are prerequisite to spontaneous speech.

In an earlier study (Kahn, 1975a) I attempted to demonstrate a relationship between Piaget's sensorimotor period and language acquisition with low functioning retarded children. I studied eight profoundly retarded children who could express themselves verbally (at least ten words) and eight profoundly retarded children who had never demonstrated expressive language. The children's scores on the Uzgiris and Hunt scales indicated that the verbal children had all attained stage six while the nonverbal children had, for the most part, not attained stage six. These findings were interpreted as indicating support for the hypothesis that stage six of Piaget's sensorimotor period is necessary, though not sufficient, for the acquisition of speech.

If, as these findings seem in indicate, the cognitive structures which develop during stage 6 of Piaget's sensorimotor period are necessary for the acquisition of expressive language, then training of nonverbal profoundly retarded children to develop

language skills should begin with an assessment of their cognitive level. According to this position, those children who are at stage 6 could then reasonably be expected to learn language skills with relative ease and operant techniques would appear appropriate. However, those children who are not functioning at stage 6 would not be expected to learn expressive language with any reasonable degree of efficiency. These children would probably benefit more from training activities directed toward raising their cognitive level. After this is accomplished, so that they are functioning at stage 6, it would then be reasonable to expect them to learn language from operant procedures with a much higher degree of efficiency. However, if this approach is to be implemented,, it must first be demonstrated that severely and profoundly retarded children can benefit from such a procedure. The study on which I am now going to report attempted to do just that.

The present study was an attempt to accelerate the rate at which severely and profoundly retarded children develop object permanence and to demonstrate generalization of the higher performance on the object permamence scale to other scales of sensorimotor intelligence and to the learning of expressive language.

There were two phases of training in the present study. The first phase consisted of training severely and profoundly retarded children in the area of object permanence. After the training and two posttests (the second one to demonstrate durability of the training), the second phase of the study began. In this phase

two of the successful experimental group children and two of their controls were matched with two other children who demonstrated competence equal to the two experimental subjects on the object permanence scale but, who had received no training. All six of these children received, and still are receiving training in language.

PHASE I

Subjects

The subjects in the initial phase of training were eight children living in a residential facility for severely and profoundly retarded children. None of the children in this study had demonstrated any expressive communication skills. These children were also functioning well below the ceiling on each of the scales of the Uzgiris and Hunt (1975) instrument. The subjects were matched for age, etiology, and scores on the object permanence scale of the Uzgiris and Hunt instrument and then randomly assigned to either the experimental group or the control group.

The four subjects in the experimental group had chronological ages (CAs) ranging from 43 to 72 months with a mean CA of 57 months. Three of these children's etiologies were Down's Syndrome. The fourth child had brain damage, the suspected cause of which was encephalitis.

The four subjects in the control group had CAs ranging from 43 to 78 months with a mean CA of 56 months. Three of these children's etiologies were also Down's Syndrome. The fourth child's

etiology was designated "unknown brain damage."

Procedure

All of the subjects were individually given a pretest and two posttests by the same tester using the Uzgiris and Hunt (1975) instrument. This instrument consists of seven parallel scales of intellectual development: Object Permanence, Means, Schemes, Causality, Vocal Imitation, Gestural Imitation, and Spatial Relations.

The four control subjects received the pretest, six months later the first posttest, with no special training in the interim, and 12 months later the second posttest. The four experimental subjects received the pretest, followed by individual training in an isolated room for 45 minutes a day, three days a week, for six months, then the first posttest, followed 12 months later by the second posttest. The trainer did not participate in the testing and used different materials than were used for testing. The training was individualized for each child and consisted of a concentrated effort to have the child demonstrate gains in his performance in the area of object permanence. Object permanence was selected as the area to be trained because Piaget states that object permanence is necessary for a child to use memory and mental imagery; crucial aspects of the sort of cognitive functioning necessary for language acquisition. Positive reinforcement (food and praise) was used to keep the child interested in the task. The steps followed in the training procedure were those of the object permanence scale of the Uzgiris and Hunt Instrument. This

order was followed because the steps for this scale have been shown to be ordinal for a severely and profoundly retarded sample (Kahn, 1976). Training began with the lowest step on which the child could not demonstrate criterion. The criterion for each step was considered achieved when the subject demonstrated success on the step, with no errors, for two consecutive sessions. Training then continued on the next step through successive approximations of that step. If repeated efforts on the next step were unsuccessful, overlearning of the preceding step was begun.

To further explain the training procedure used in this study, two concrete examples are given (from Kahn, in press). In the first case, the child could locate an object (a doll) when it was partially covered but not when totally covered. We started with the doll half covered (legs and feet showing) and slowly, step by step, covered more of the doll with the child finding it at each successive step. Eventually, the doll was totally covered. At this point, the doll was placed under the cover so as to present a large lump. The child was able to find the doll and the lump was gradually made smaller until the child could find the doll totally covered and laying flat.

The second example presents a simpler procedure though the procedure took as long as the one previously presented. In this case, the child could find an object when covered by one screen. When the object was alternately hidden under one of two screens, however, he did not always go to the correct screen first. Since

the child did search under the second screen when wrong at first, we believed that just letting him practice this task would eventually lead him to solve the problem correctly. This was based on Piaget's theory that children develop cognitively through interacting with their environment. As will be shown in the next section of this paper, both of these procedures were found to be successful.

Results and Discussion

All four of the experimental subjects achieved criterion for the highest item on the object permanence scale of the Uzgiris and Hunt (1975) instrument on the first posttest. This represents gains from the pretest ranging from seven to eleven steps with a mean gain of 9.5 steps. In addition, three of the experimental subjects demonstrated improvement on five of the other six Uzgiris and Hunt scales, the other experimental subject gaining on four of the scales. These gains ranged from one to five steps.

Only one of the control subjects showed any change in functioning on these scales from the pretest to the first posttest. This subject gained two steps on the object permanence scale and one step on the means scale. However, he also lost two steps on each of the spatial relations scale. The gains and losses demonstrated by the subjects, from the pretest to the posttests, on each of the scales are presented in Table 1.

Insert Table 1 about here

As can be seen in Table 1, some of the gains made by the experimental subjects were not retained over a 12 month period

following the conclusion of the training program. The gains made in object permanence, while still ranging from six to nine steps higher than the initial testing, are one to three steps lower than immediately following the training program and the scores are no longer at the ceiling of the scale. However, all of the experimental subjects are still performing at stage 6 on this scale. On the other six scales, the experimental subjects evidenced minor gains and losses between the two posttests, with the gains and losses balancing each other out. Similarly, the control subjects evidenced minor gains and losses between the two posttests, with gains and losses for the seven scales being approximately in balance.

These findings seem to indicate that the training was reasonably durable with some small generalization to other scales. Since other investigators (Rose, 1974, Sigel, 1975, Uzgiris, 1976) indicate that object permanence is evidence that the child has the structures necessary for representation and for imitation, phase II, language training, was begun.

PHASE II

Subjects

Two of the experimental subjects (#s 3 and 4) and two of the control subjects (#s 3 and 4) continued in phase II of the study. An additional two children were selected from the same residential facility on the basis of age and etiology. In addition, these two subjects were selected so as to have approximately the same level of cognitive functioning on the Uzgiris and Hunt scales

as the two experimental subjects had on their second posttest.

Procedure

All six subjects received individualized language trai ing from the same trainer for 20 minutes a day, five days a week. The training program utilized was the one developed by Bricker, Dennison, and Bricker (1976). This program consists of 26 phases of training beginning with sitting and ending with the production of three word phrases. The phases of training are presented in Table 2.

Insert Table 2 about here

Each child began the program at the most appropriate phase for that child based upon a baseline probe. None of the children began any higher than phase 6, gestural imitation, and four of the children began at phase 2, eye contact. Training has been underway for seven-and-a-half months.

Results

The results show that the four subject's who were at stage six of object permanence prior to the implementation of the language training program progressed far more than the two control subjects who were below stage six of object permanence. In addition, the two children who had achieved stage six without training appear to have progressed slightly further in the program than the two children who received object permanence training.

Insert Table 3 about here

As can be seen in Table 3, the two new children in the study have progressed from phase 2 (eye contact) to phase 23 (production of two-word phrases) and from phase 5 (early gestural imitation) to phases 24 and 25 (imitation and comprehension of three-word phrases). At the same time, the two children trained in object permanence progressed from phase 2 (eye contact) to phase 20 (production of verbs) and from phase 6 (gestural imitation of familiar actions) to phases 21 and 22 (imitation and comprehension of two-word phrases). The control subjects have not yet reached the linguistic phases of training and are both presently working on imitation of new sounds (phase 10).

Discussion

The results of the present study are in part supportive of Piaget's theory and in part in conflict with Piaget's theory. Piaget is opposed to the training of his theoretical concepts. He believes that the stage related concepts, which are the basis of his theory, can not be taught. Rather they must be acquired through the developmental process (Piaget, 1970). The results of this study and those of Henry's (Note 8) indicate that severely retarded children can be taught to acquire sensorimotor concepts through rather direct intervention. Henry's findings indicate that the training of these concepts are generalizable to other

sensorimotor concepts. This implies that there may be similar concepts underlying various sensorimotor areas previously thought to be somewhat independent. The present findings indicate that the training of these concepts are relevant to the further training of certain skills. This relationship between trained object permanence and more effective language training indicates that the training of Piagetian concepts is not only possible but may have long term educational benefits. More research is needed to pinpoint those areas most amenable to this type of intervention.

The findings showing a relationship between the subject's levels of cognitive functioning and the success of a language training program are extremely important. Previous research (e.g., Kahn, 1975a; Moerk, 1975) had indicated only a concurrent relationship between sensorimotor period functioning and language acquisition. That, is, at a given time there is a correlation between cognitive level and language skills. The present study, however, demonstrated that children who were at a particular cognitive level (stage six of object permanence in this case) learned far more from a language training program than children who were functioning at a lower cognitive level. These findings are quite supportive of the Piagetian proposition that the learning of particular skills is dependent upon the prior acquisition of a particular level of cognitive functioning.

These findings are of potentially great importance. However, this statement must be qualified because of limitations in the present study. The number of subjects used in this study is

admittedly small. While it seems unlikely that the dramatic improvements shown by the experimental subjects are just specific to the present study, a replication is needed. In addition, the use of a control group, rather than a placebo group for the object permanence training, limits the generalization of these findings to other situations. The improvement could have been due to the specific training procedure utilized in this study or merely to the individual attention given the experimental subjects. However, the far greater improvement shown by the experimental subjects in the ares of object permanence, than in the other areas of sensorimotor intelligence, indicates that the training procedures did have some effect. Also, while the cause of the improvement may be in doubt, there was a good deal of improvement in a relatively short period of time. This finding by itself is significant.

Obviously, there is a need for further research in this area. We need to replicate and expand the present study. We also need to determine what, if any, other skill learning is related to Piagetian, or other, concepts in child development and which of these concepts can be taught. The present study is merely a beginning from which only tentative conclusions can be drawn. It does appear, however, that Piagetian concepts are trainable. It also appears that the success of a training program can be demonstrated through generalization to other related concepts and/or to related skill learning.

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Table 1

Pretest to Posttest Gains and Losses on the Uzgiris and Hunt Scales

Subjects	Scales: Object Permanence	Means	Schemes	Causality	Vocal Imitation	Gestural Imitation	Spatial Relations
Experimental 1 (3)[a]	+11[b](-2)[c]	+2[b](+1)[c]	+1[b](0)[c]	+3[b](0)[c]	0[b](+1)[c]	+1[b](+1)[c]	+5[b](-1)[c]
Experimental 2 (4)	+10(-3)	+2(0)	+1(0)	+2(0)	0(0)	+1(0)	0(+1)
Experimental 3 (7)	+ 7(-1)	+3(0)	+2(0)	+3(0)	0(0)	+1(0)	+3(0)
Experimental 4 (4)	+10(-2)	+2(-1)	+1(+1)	+3(-1)	0(0)	+3(-1)	+4(-1)
Control 1 (3)	+ 2(0)	+1(0)	0(+1)	0(0)	0(0)	0(-1)	-2(+1)
Control 2 (4)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(-1)
Control 3 (6)	0(+1)	0(0)	0(0)	0(0)	0(0)	0(-1)	0(0)
Control 4 (5)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(+1)

[a]pretest scores on the object permanence scale

[b]changes from pretest to first posttest

[c]changes from first posttest to second posttest

Table 2

Phases of Language Training

Phase 1: Sit in Chair

Phase 2: Eye Contact

Phase 3: Work on Task

Phase 4: Increase Vocalization

Phase 5: Early Gestural Imitation

Phase 6: Gestural Imitation of Familiar Actions

Phase 7: Gestural Imitation of Unfamiliar Actions

Phase 8: Sound Imitation - Child Initiated

Phase 9: Sound Imitation of Familiar Sounds

Phase 10: Sound Imitation of Unfamiliar Sounds

Phase 11: Early Word Recognition

Phase 12: Functional Use of Objects

Phase 13: Appropriate Use of Objects

Phase 14: Verbal Imitation of Component Sounds

Phase 15: Imitation of Nouns (Criterion is 10 Nouns)

Phase 16: Comprehension of Nouns (Criterion is 10 Nouns)

Phase 17: Production of Nouns (Criterion is 10 Nouns)

Phase 18: Imitation of Verbs (Criterion is 10 Verbs)

Phase 19: Comprehension of Verbs (Criterion is 10 Verbs)

Phase 20: Production of Verbs (Criterion is 10 Verbs)

Phase 21: Imitation of 2-word Phrases (Criterion is 10 2-word Phrases)

Phase 22: Comprehension of 2-word Phrases (Criterion is 10 2-word Phrases

Phase 23: Production of 2-word Phrases (Criterion is 10 2-word Phrases)

Phase 24: Imitation of 3-word Phrases (Criterion is 10 3-word Phrases)

Phase 25: Comprehension of 3-word Phrases (Criterion is 10 3-word Phrases

Phase 26: Production of 3-word Phrases (Criterion is 10 3-word Phrases)

Table 3

Progress of Language Training

Stages of Training	Subjects					
	Experimental[a]		Control[b]		New[c]	
	#3	#4	#3	#4	#1	#2
Phase at which Training began	Phase 2	Phase 6	Phase 2	Phase 2	Phase 2	Phase 5
Phases Completed	Phases 2-19	Phases 5-20	Phases 2-9, 11 and 12	Phases 2-9, and 11	Phases 2-22	Phases 5-23
Present Training Phase	Phase 20	Phases 21 and 22	Phase 10	Phase 10 and 12	Phase 23	Phase 24 and 25
	The subject produces 3 verbs.	The subject imitates & comprehends 4 2-word phrases.	The subject imitates no unfamiliar sounds.	The subject imitates no unfamiliar sounds and uses 3 objects appropriately.	The subject produces 6 2-word phrases.	The subject imitates and comprehends 4 3-word phrases.

a. Subjects trained in object permanence.

b. Subjects below stage six.

c. Subjects at stage six of object permanence without receiving training.